Awareness and Practices on Preventing Chronic Kidney Disease among Diabetes Mellitus Patients at Teaching Hospital, Batticaloa, Sri Lanka

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Abstract- Chronic Kidney Disease (CKD) has become a global burden and affects more than 10% of the population. There are many triggering factors which cause progressive and irreversible damage to the kidneys. Among those factors Diabetes Mellitus (DM) is a leading cause of CKD. In Sri Lanka the number of CKD patients rapidly increased in last three decades and still CKD is an unsolved problem and it seems that the disease severely affecting the patient's lives due to multiple factors including lack of proper treatment facilities. Hence this study was aimed to assess awareness and practices on preventing Chronic Kidney Disease among diabetic patients attending medical clinic at Teaching Hospital, Batticaloa. A cross sectional descriptive study was carried out to assess the awareness and practices on preventing CKD among 290 patients with DM attending medical clinic at Teaching Hospital, Batticaloa. Systematic sampling method was employed to recruit participants. After obtaining informed consent, data were collected through a pilot-tested, validated and interviewer administered questionnaire. Statistical package of Social Sciences version-26 was used for analyzing the data for obtaining frequencies and percentages using descriptive statistics. Nearly two third (60.7%) of the participants had heard about CKD even though in the same population, nearly half of the respondents (52.1%) had not aware that DM can cause CKD. 151 participants (52.1%) did not know that controlling blood sugar level can prevent CKD. The percentage of the individuals who assume that CKD can be caused by usage of some medications was 58.6%. Alcohol consumption (53.4%) and smoking (50.7%) were seen as risk factors of higher prevalence. However, majority of the participants had poor awareness that high blood pressure (56.9%), heart disease (71%) and obesity (85.5%) have associations with CKD. A higher percentage (88.6%) of the participants were following regular clinic and 56.9% individuals check their blood sugar level from the private setup when they were unable to attend the clinics. Majority of them (68.6%) had appropriate BMI and 81.7% were following good diet pattern. But they had poor practice on doing exercise (60.7%) and doing annual urine tests (52.8%). The findings reveal that more than half of the respondents had inadequate awareness on preventing CKD. Good practices towards preventing CKD were found in an optimal level. Awareness on the areas such as regular exercise and annual checkups should be improved in this population.

Index Terms- Chronic Kidney Disease, Diabetes Mellitus, Awareness, Practices

I.   INTRODUCTION

The kidneys are one of the most important organs in the human body, as it plays a major role to remove wastes, extra fluids and also acid which is produced by the bodily cells, from the body and to maintain a healthy balance of water, salts and minerals such as Sodium, Potassium, Phosphorus and Calcium. The kidney related diseases are as complex as the structure and the function of the kidney. Impairment of the kidney function can lead into several types of kidney disease. There are two types of kidney disease known as short-term or acute kidney injury, a sudden decline of the kidney function and lifelong or chronic kidney disease, a gradual loss of kidney function over a long period of time. A short-term kidney disease can be fully recovered, but it may be developed into a chronic kidney disease in later life [1]. Chronic Kidney Disease (CKD) has become a global burden and affects more than 10% of the population [2]. According to the current international guidelines, the CKD is characterized by reduced Glomerular Filtration Rate (GFR) less than 60 mL/min per 1.73 m2 for more than 3 months [3]. Based on the GFR, CKD can be classified into five stages [4]. The stage– 1 is a mild disease and stage– 5 is the most severe form of CKD and it is known as End Stage Renal Disease (ESRD) [5]. ESRD is an irreversible stage of CKD where the kidney function is below 10% of their normal function. There are many triggering factors which cause progressive and irreversible damage to the kidneys. Some of them are older age, family history, diabetes mellitus, high blood pressure, poor glycemic control and smoking [5]. Among these factors, diabetes is a leading cause of CKD [6]. The Global Burden of Disease is a study on cardiovascular diseases carried out in 2015. This study indicates that 1.2million deaths of cardiovascular diseases has a direct

involvement of reduced GFR [5]. The 2016 world wide report shows the progression of CKD from 1990. According to this report, in each year more than 21million of CKD patients has been diagnosed worldwide and nearly 1.2million died due to CKD [4]. The prevalence of CKD due to diabetes and hypertension is high in developing countries [4].

According to the records published in 2017, CKD is the 12th leading cause of death worldwide [3]. A meta-analysis has estimated the prevalence and deaths of CKD all over the world respectively as 9.1% in 2017 and 1.2million the number of deaths due to CKD has been projected to be 2-4 million by 2040 [7]. In the United States, only 24.3% of people with Glomerular Filtration Rate (GFR) 15-60 ml/min were aware of CKD, as well as in Australian study, hypertension and diabetes were cited as risk factors by only 2.8% and 8.6% of the study population respectively, another study shows that among African Americans, 23.7% people had an idea of at least one diagnostic test for kidney disease. In the same study a few consider CKD as a significant health condition [8]. A study which has been conducted among the population in Bangladesh showed that only 11% of the respondents had good knowledge and 60% of them had very less knowledge about CKD [3].

Diabetes mellitus and hypertension are the principle causes of CKD in both developed and developing countries in the world [5]. Diaabetic nephropathy is the most frequent cause of CKD and both these conditions have high mortality and morbidity rate as they progressively impair the renal function. Globally, kidney replacement therapy is widely performed as the best management option for CKD in diabetes [9]. As a conservative management, drug therapy is used to slow down the progression of the Diabetic Kidney Disease (DKD). Angiotensin converting enzyme inhibitors and angiotensin receptor II blockers are the drugs of choice for DKD. In addition, novel agents such as sodium glucose cotransporter-2 inhibitors, non-steroidal selective mineralocorticoid receptor antagonists and endothelin receptor antagonists which were recently added to the therapeutic regimen have been identified effective in the management of DKD. These drugs will be used in the routine management soon as they have shown improvement in the clinical outcomes and lowering blood pressure [9]. Kidney transplantation or hemodialysis are the treatment options for the patients with ESRD [10].

In Sri Lanka, the number of kidney patients rapidly increase in last three decades and still CKD is an unsolved problem and it seems that the disease severely affecting the patient's lives due to the lack of proper treatment facilities [11]. Past researchers have identified 15.1% to 22.9% prevalence of kidney disease in some districts in Sri Lanka and they have shown CKD has become major public health issue [11]. None of the current sources of data in the country allows for accurate estimation of the burden and trends of CKD in the country [12]. According to Vithanage et al., (2021) CKD is mainly prevalent in the North central, North western, Uva, Central, Northern and Eastern Provinces in Sri Lanka while, Ministry of Health (2017) reported, in the Eastern province Trincomalee and Ampara districts are the high-risk areas for the kidney diseases [11]. In many cases, CKD is only found when it is in late stages and at this stage kidneys have lost 90% of its function [10]. Early detection and treatment are the most effective ways of controlling CKD. Despite it has very poor clinical identification till it progresses into final stages as the patients have poor awareness on CKD [13]. Patients should be screened for clinical indicators of renal dysfunction to determine whether they are susceptible to have CKD in future [4]. It is very important to have enough knowledge about the risk factors. Among all the risk factors lifestyle factors plays a major role. Population based prevention program is the best approach of controlling CKD such as a survey method [14].

The researchers had observed the poor awareness about CKD during their practice at the hospital. Most of them had no idea about how did they develop CKD or what is the association between CKD and DM or what are the preventive measures of CKD. Unfortunately, at this point they have to go for dialysis or kidney transplantation for survival. Therefore, the researchers strongly believe that improving the awareness and acknowledging the people about preventive methods may improve the condition. This was our first impression on this problem to select this topic.Though many studies have been conducted worldwide to assess the awareness and practices on preventing CKD among diabetes patients but in Sri Lanka the previous research related to CKD mainly target the unknown etiology of CKD and it has found association of CKD with farmers and water resources. While reviewing the literature we could not find any research study related to CKD among diabetic mellitus patients especially in Batticaloa district in Sri Lanka. The researchers hope that the finding of this study would be valuable for the early detection and prevention of CKD among diabetes mellitus patients in future. This would lead to slow the progression of early ESRD among diabetic patients. So the awareness and practices on preventing Chronic Kidney Disease among Diabetes Mellitus patients attending medical clinic at Teaching Hospital, Batticaloa were studied in a systematic way in this study.

II. RESEARCH ELABORATIONS

A. Methodology

A cross sectional descriptive study was carried out among Diabetic Mellitus patients who were attending medical clinics in Teaching Hospital, Batticaloa during one month of time period and who were between 25 to 90 years of age. As the researchers were able to get the permission from the director of the hospital, the data was collected from those patients in a systemic manner, after getting informed consent. Both male and female Diabetic Mellitus patients of type-I and type-II who were attending medical clinics in Teaching Hospital, Batticaloa during the study period were included. Diabetic patients who were already living with ESRD and the diabetic patients who were unable to give consent due to various reasons were excluded. The total sampling size 290 was calculated according to the Krejci & Morgan Formula (1970), for the estimated population size 800 and 0.50 population proportion with 1 degree of freedom [15]. Systematic sampling method was used in this study. Every 3rd diabetes mellitus patient was included in the study. The estimated

population size was 800, because per week, according to the medical records, 200 diabetes mellitus patients were present and we did the data collection for 4 weeks.

B. Procedures

The data was collected using a pilot tested, validated and interviewer administered questionnaire which consists of, socio demographic characteristics, questions regarding awareness on CKD and questions on practices towards early detection and prevention. The face validity and the content of the questionnaire assessed individually by two medical experts and one nursing expert. A pilot study was conducted among selected 10 diabetes mellitus patient of Teaching hospital, Batticaloa to test questionnaire for its feasibility and its applicability. These patients were excluded from the final study. Permission for data collection was obtained from the Director of Teaching Hospital, Batticaloa. The administration of the interviewer administered questionnaire for the collection of the data was carried out by investigators. The purpose and benefits of the study were explained to the respondents by using information sheet and consent sheet. Consent was obtained from the participants before the data collection. A suitable time and duration, comfortable environment and needed facilities were arranged to the participants. Awareness and practice were obtained as categorical variables through descriptive analysis using a statistical software SPSS 26. The descriptive analysis was employed in calculation of frequency and percentage. One mark was given for each correct response of awareness question and the total attainable score was 13 of which was converted to 100% and the scores were graded as lower level (Below 50) and higher level (50 and above). For the practices questions, the total attainable score was 10.

III. FINDINGS

Chronic kidney disease (CKD) is a progressive disease which gradually impairs the function of the kidney by replacing healthy kidney tissue with fibrotic tissue [16]. It is one of the most burning health problems among diabetes mellitus (DM) patients all over the world. Since CKD has associated with high rates of morbidity and mortality, its negative impact on health system & the global economy is significantly high [13]. The current study employed a total of 290 Diabetes Mellitus (DM) patients, 46.6% were male and 53.4 % were female. A higher number of DM patients 100 (34.5%) were found in the age group 51 – 60 years and the lowest number was 2 (0.7%) among aged 81 -90 years. Nearly one third of them (32.1%) had completed secondary education. Around 66.2% individuals were unemployed while 33.8% were employed and 23.1% had monthly income between 26000- 50000 and almost half of them (52.4%) were from rural areas. Considerable number of participants 134 (46.2%) had been diagnosed with DM within 5 years period and 113 (39%) had been living with diabetes mellitus for more than 5 years. Newly diagnosed patients having less than 1-year history of diabetes was 43 (14.8%).

According to past literature, the total number of diabetic patients has been estimated to increase by 227 million (16.7%) during 2015-2040-time period [17]. The risk of diabetic associated complications especially the risk of CKD will be increased simultaneously. More importantly, compared to those Western countries the risk of having CKD is more likely to have among Asian countries [17]. However, as it takes months to years for the progression of CKD in DM patients early diagnosis impacts positively to reduce morbidity and associated complications of CKD [3]. This can be accomplished by improving patient's awareness & suggesting healthy practices such as healthy diet, maintain BMI, regular exercise, regular clinical follow up & checkups [18].

A. Awareness on Chronic Kidney Disease (CKD)

Overall half of the study participants 176 (60.7%) had heard about CKD and 114 (39.3%) participants responded as they have not heard about CKD. Only 47.9% of respondents were well aware that DM may lead into CKD and around 52.1% were not aware about that (table 1).

Table 1: Awareness on CKD

Awareness regarding CKD (n =290)	Yes		No		Don't know	
	N	%	N	%	N	%
Have you ever heard about chronic kidney disease?	176	60.7	84	29	30	10.3
Diabetes mellitus leads to CKD.	139	47.9	94	32.4	57	19.7

The participants had different levels of awareness on diagnostic measures, signs and symptoms. Poor awareness regarding blood tests doing for diagnosing CKD was observed. Although only 47.9% participants responded that controlling blood sugar level will reduce risk of CKD. A noticeable number 170 (58.6%) of the patients believed that usage of some drugs can cause CKD. Around 63.8% of patients believed some drugs can slow down the progression of CKD and an outstanding number 259 (89.3%) of participants responded that following health advices also can do the same. 25.2% participants responded that no any early signs and symptoms for CKD in its early stage (Table2).

Considering the awareness on risk factors of which might rigger CKD, only 43.1% had awareness that high blood pressure is a risk factor. Likewise, only 29% and 14.5 % respondents stated that heart disease and obesity are CKD risk factors respectively. However, half of the patients 50.7% recognized smoking and 53.4 % recognized alcohol consumption as risk factors.

Table 2: Awareness regarding CKD diagnostic measures, sign and symptoms

Awareness (n=290)	Yes		No		Don't know	
	N	%	N	%	N	%
CKD is diagnosed among the people with diabetes at the hospital by doing blood tests.	138	47.6	76	26.2	76	26.2
CKD may not have any symptoms at the initial stage.	73	25.2	124	42.8	93	32.1
Strict control of blood sugar level can reduce the risk of getting CKD.	139	47.9	66	22.8	85	29.3
There are some drugs which can slow down the progression of CKD.	185	63.8	44	15.2	61	21
There are some drugs which can cause CKD	170	58.6	49	16.9	71	24.5
Adherence to the medical advises can delay progression of CKD.	259	89.3	6	21	25	8.6

According to, the overall awareness of respondents in highest percentage in 54.5% of them have low level awareness on preventing CKD (figure 1). Only 9.7% of them had good awareness. This was closely similar with the results reported from Nepal (57.6%) and lower than the results reported from Ethiopia (63.5%) but higher than what was reported from another cross-sectional study from Ethiopia (11.9%) [3] [14]. Another study done in India revealed overall poor awareness of CKD (78.64%) [6].Nearly two third (60.7%) responded that they have heard about CKD before. When comparing our results with a similar study done in South-West Nigeria [19]. They revealed nearly half of our finding (33.7%). The reason for the notable variation of the results might be because of disparity of the health literacy of the study populations. According to the results of the study only 47.9% participants responded as Diabetes Mellitus (DM) causes CKD. More than half of the population (52.1%) had low awareness of that DM can cause CKD. These results tied well with previous studies done in Nigeria, Ethiopia, Tanzania and Nepal [3] [13] [19] [20]. Since DM is the commonest risk factor of CKD the low level of awareness regarding this fact increases the vulnerability to develop CKD among DM patients.
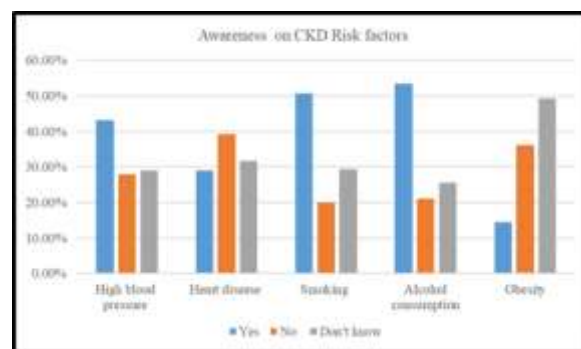

Figure 1: awareness on CKD Risk factors

Majority of the study population (52.4%) responded that the CKD is not diagnosed by doing blood test in the hospital. Only 47.6% had awareness regarding CKD can be diagnosed with a blood test. This poor awareness might relate to the confusion of the exact purpose of doing blood test because they do blood tests also for the existing DM condition at their regular booked clinics. Findings on awareness that CKD could present without any symptom at its early stage has highlighted that only 25.2% of the population had good awareness about the fact. This result suggests low awareness similarly the results of a research done among DM patients in India [6]. 47.9% study participants had responded controlling blood sugar can prevent the occurrence of CKD. Meanwhile more than half of the participants

(52.1 %) had low awareness of the importance of glycemic control towards preventing CKD. This result has been supported by similar study done in Australia in 2016. They have described that blood glucose control can slow down the kidney damage [21].

More participants (63.8%) had awareness that some of the drugs can decelerate CKD. Surprisingly we noticed that more than half of the patients had misconception that some of the hypoglycemic drugs such as Metformin can cause CKD. Therefore 58.8% respondents answered as some drugs can cause CKD. This poor conception should be addressed very strongly otherwise they may develop poor drug compliance & can worsen the condition even more. Thus, an outstanding number of research participants (89.3%) believed that by following health advices can prevent the risk of CKD. Regarding risk factors of CKD, majority identified alcohol consumption (53.4%) followed by smoking (50.7%), high blood pressure (43.1%), heart disease (29%) & obesity (14.5%). In Nepal study they have demonstrated alcohol consumption were identified as a risk factor of CKD by (88.5%) [3]. In the same study smoking has been identified as the 2nd commonest risk factor by (81.8%), obesity was identified by (67.3%) as the 3rd commonest risk factor & hypertension was identified by (65.5%) as 4th commonest risk factor. Meanwhile in Tanzania study (17%) reported hypertension & 11% reported alcohol consumption as risk factors for CKD [20].

B. Practices towards early detection and prevention of chronic kidney disease

Majority 257 (88.6%) of the patients follow the regular clinics and 56.9% patients check blood glucose level on non-clinic days at their own expense. We also found that around 63.4% of the respondents undergo blood tests and only 47.2% undergo urine tests to check kidney function annually. Interestingly 81.7% of the patients have changed their diet pattern after diagnosed as DM but only 39.3% follow physical exercises routinely. Most of the patients had optimal BMI and it is about 68.6% as a proportion. Their medical compliance was very high. Around 76.9% patients only use oral medications and 23.1% use insulin to control blood glucose level. Among the research participants 41% believed that ultra sound scan is more useful than urine tests for the detection of CKD. Majority 59% participants selected urine tests over ultra sound scan to detect CKD (Figure 2). While analyzing the practices among diabetes mellitus patient who attending medical clinics in Teaching Hospital, Batticaloa the study participants 69.6% had high level of practices to prevent CKD (figure 2).
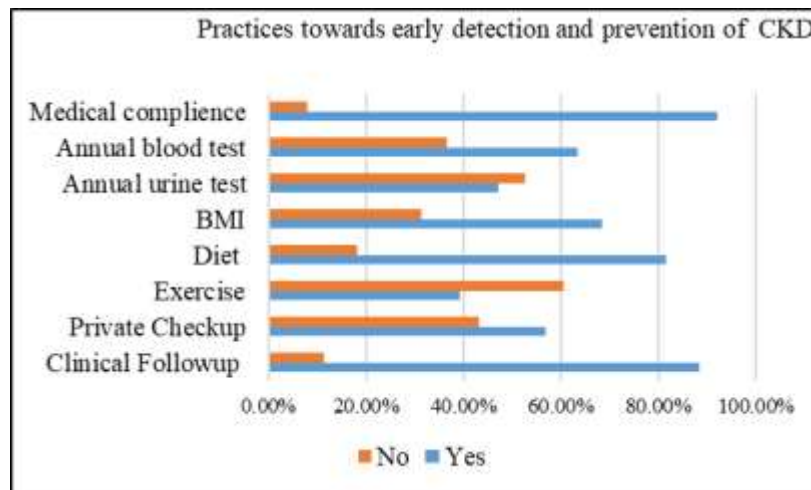

Figure 2 Practices towards early detection and prevention of CKD

By taking all of the data into account, we observed a high level of overall practice (69.6%) among study population (figure 3). However, a few areas of low practice were evident such as doing regular exercise, undergo annual routine urine test. Since prevention is better than cure, it is important to address & improve practice towards CKD prevention at all possible areas. Also in the Pakistan study, they have demonstrated high level of practice (89%) [8]. A similar result has been reported in the Rwanda study as well [22]. Majority of the study population (88.6%) regularly follow up their booked clinics & more than half of the population (56.9%) check their blood glucose level on non-clinic days at their own expense. In the Pakistan study, they have demonstrated similar positive result in same practice (65.86%) and (54.23%) respectively meanwhile a Rwanda study also have the same results [8] [22]. As many of the studies have emerged the importance of glycemic control in order to prevent CKD by slow down GFR loss among DM patients this result is very much satisfying [21].

A Norwegian study recommended moderate level of exercise for at least 30 minutes per day [23]. Nevertheless, among the present study population majority (60.7%) of the participants do not engage in regular exercise. Only 39.3% of the DM patients responded as they do regular exercise. Report from another study in Rwanda has showed half of the participants do exercises (50%) among 132 study sample [22]. This difference might be due to differences of the selected population size of the studies. Regarding food pattern, majority of them (81.7%) responded that they changed their diet pattern according to the medical advices. Only 18.3% DM patients had negative

practices on diet. Similar results have been demonstrated in Rwanda [22]. In the present study, 68.6% of the population were in the optimal range of BMI. A similar result has been obtained in the Rwanda study as well [24]. Interestingly, 92.1% responded good drug compliance. The Rwanda study also have highlighted high level of drug compliance [22].
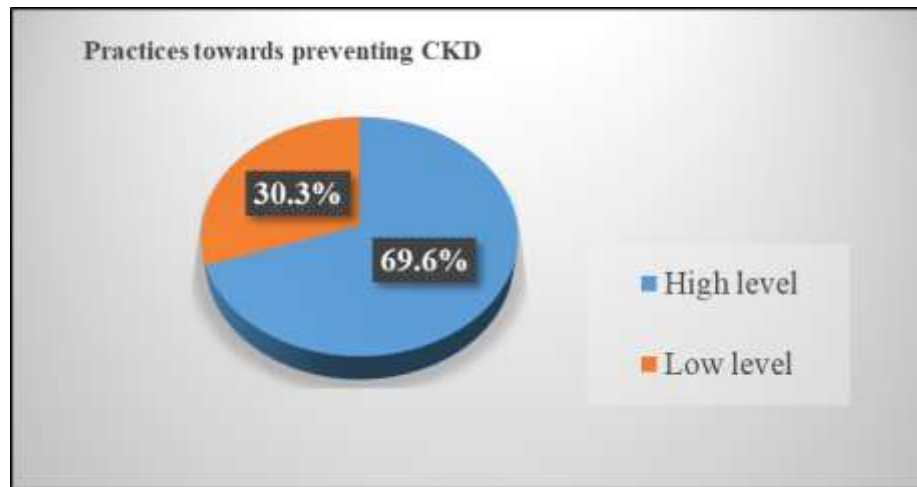

Figure 3 Practices towards preventing CKD

This result might associate to good awareness or their positive perception on drug compliance rather than behavioral changes. In the present study, even though the majority of the DM patients follow up their booked clinics regularly their overall awareness of CKD was low. We believe that it is the responsibility of the health professionals to educate patients at all levels. Since practice is highly influenced by awareness, we believe that improving awareness regarding CKD can enhance active participation toward preventing CKD among DM patients attending medical clinics in THB.

IV.   CONCLUSION

Low level of awareness and good practices on preventing CKD among DM patients attending medical clinics at Teaching Hospital, Batticaloa were found. In conclusion, the results have demonstrated the study population 54.5% has generally low level of awareness on preventing CKD. Most significantly more than half of the participants (52.1%) had poor awareness on the fact that DM can leads into CKD. However, a higher percentage of patients 69.6% following good practices towards preventing CKD. The study further shows majority of the patients regularly follow-up their booked clinics, checking for blood sugar level at their own expenses, doing annual blood tests to check the renal function and most of them have done diet changes after knowing about disease. Despite a majority of the participants have low awareness of their risk to develop CKD should be notable. We believe, that it is the responsibility of the health professionals to work more on educating the patients in importance areas highlighted in this study. In order to give more emphasis on awareness on the relationship between DM and CKD, regular health education plan would be beneficial to improve the awareness on preventing CKD and also it will help to reduce the morbidity and mortality related to CKD in future.

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